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The Structure of *Diagnostic and Statistical Manual of Mental Disorders* (4th Edition, Text Revision) Personality Disorder Symptoms in a Large National Sample

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Abstract

We examined the latent structure underlying the criteria for *DSM–IV–TR* (American Psychiatric Association, 2000, *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC: Author.) personality disorders in a large nationally representative sample of U.S. adults. Personality disorder symptom data were collected using a structured diagnostic interview from approximately 35,000 adults assessed over two waves of data collection in the National Epidemiologic Survey on Alcohol and Related Conditions. Our analyses suggested that a seven-factor solution provided the best fit for the data, and these factors were marked primarily by one or at most two personality disorder criteria sets. A series of regression analyses that used external validators tapping Axis I psychopathology, treatment for mental health problems, functioning scores, interpersonal conflict, and suicidal ideation and behavior provided support for the seven-factor solution. We discuss these findings in the context of previous studies that have examined the structure underlying the personality disorder criteria as well as the current proposals for DSM-5 personality disorders.

Keywords

personality disorders; National Epidemiologic Survey on Alcohol and Related Conditions; latent structure of symptoms

High levels of comorbidity between personality disorder (PD) diagnoses on Axis II have been recognized for some time (e.g., Clark, 2007; Clark, Watson, & Reynolds, 1995; Lyons, Tyrer, Gunderson, & Tohen, 1997; Skodol, 2005; Trull & Durrett, 2005; Widiger & Frances, 1985; Zimmerman & Coryell, 1989) and especially since publication of the *Diagnostic and Statistical Manual of Mental Disorders,* third edition, revised (*DSM–III–R*; American Psychiatric Association [APA], 1987) and *DSM–IV* (APA, 1994). Many exclusionary criteria as well as "required" criteria for diagnoses (including PD diagnoses) were dropped after *DSM–III* (APA, 1980). This lead to an increase in comorbidity rates, given that diagnoses not previously allowed to co-occur within an individual were now free to do so (Hyman, 2010).

Concerning PD comorbidity, Skodol (2005) estimated that more than 50% of those diagnosed with a PD receive at least one additional PD diagnosis when assessed by

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structured interview. Most PD comorbidity appears to occur within cluster, although some individual PDs are believed to also co-occur with PDs outside their respective clusters (e.g., dependent PD and borderline PD; Skodol, 2005). Conversely, some PDs would not be expected to be comorbid given the differences in their major features (e.g., obsessive–compulsive and antisocial PD).

These high rates of comorbidity have led some to question the necessity of so many separate PD diagnoses. However, only one PD to date has been deleted from the official classification system (passive aggressive PD) since introduction of Axis II in *DSM–III* (APA, 1980). The current 10 official Axis II personality disorders of the *Diagnostic and Statistical Manual of Mental Disorders,* fourth edition text revision (*DSM–IV–TR*; APA, 2000) include schizoid, schizotypal, paranoid, borderline, antisocial, histrionic, narcissistic, avoidant, dependent, and obsessive–compulsive personality disorders. *DSM–IV–TR* further groups the 10 PDs into three clusters based on phenotypic similarity: Cluster A (schizoid, schizotypal, paranoid); Cluster B (borderline, antisocial, histrionic, narcissistic); and Cluster C (avoidant, dependent, obsessive–compulsive). Previous attempts to "validate" the cluster or disorder structure of the PD symptoms have produced mixed results (see Sheets & Craighead, 2007, for a review of these studies).

Excessive PD comorbidity has also led to a call for identification of a smaller set of common attributes that underlie personality pathology, and some have argued that a dimensional structure of personality pathology underlying the PD symptoms may better serve as a foundation for such a reduced classification scheme. For example, Widiger and Simonsen (2005) identified 18 different proposals for a dimensional model of personality disorders. Of most interest to the present study, several proposals involved either new dimensional reorganizations of the PD diagnostic criteria or attempts to integrate Axis II PDs with existing dimensional models of general personality structure. Across these 18 models, four higher-order domains of personality frequently appeared: extraversion versus introversion; antagonism versus compliance; constraint versus impulsivity; and emotional dysregulation versus emotional stability. There are indeed many studies providing support for these four major dimensions of personality pathology, but the support has been garnered primarily from questionnaire-based data obtained on non-DSM-based measures of personality pathology.

Fewer studies have examined the underlying structure of PDs using interview-based, PD symptom-level data (i.e., criteria). Most studies either factor analyzed self-report questionnaires related to (but not isomorphic with) DSM PD symptoms or assessed the factor structure of indices of the 10 PD diagnoses (e.g., symptom counts or categorical diagnoses themselves). Among the handful of studies that have factor analyzed individual PD symptoms from *DSM–III–R* or *DSM–IV*, reported solutions include those for 10 factors (Durrett & Westen, 2005; Howard, Huband, Duggan, & Mannion, 2008; Huprich, Schmitt, Richard, Chelminski, & Zimmerman, 2010), nine factors (Blackburn, Logan, Renwick, & Donnelly, 2005), seven factors (Thomas, Turkheimer, & Oltmanns, 2003), and five factors (Nestadt et al., 2006). Table 1 presents a listing of these studies, including sample characteristics, PD instruments used, and factors identified.

In summary, although several attempts have been made to identify the latent structure underlying the DSM PDs, little consensus exists regarding the number or nature of these factors. The diversity in methods (questionnaire, interview, peer report), unit of analysis (PD symptoms, PD diagnoses), and analytic strategies (factor extraction and rotation methods) have all likely contributed to this lack of consensus, and few attempts have been made to validate these factor solutions with external criteria.

The purpose of the present study was to explore the underlying structure of *DSM–IV–TR* PD symptoms assessed via diagnostic interview, in a large nationally representative sample of U.S. adults. In addition to examining the latent structure of covariance patterns at the PD symptom level, we also evaluated the validity of the factor solution by correlating factor scores with a range of external outcomes, including Axis I disorders, treatment for mental health problems, functioning scores, interpersonal conflict, and suicidal ideation and behavior.

Method

Data for the present analysis were selected from Waves 1 and 2 of the National Institute on Alcohol Abuse and Alcoholism's National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). The NESARC is a nationally representative, face-to-face survey that evaluated mental health in the civilian, noninstitutionalized population of the United States, including citizens residing in Hawaii and Alaska (Grant, Kaplan, Shepard, & Moore, 2003). Participants were sampled according to 2000/2001 census data using stratification on important demographic and population features at the county level, and the data were subsequently weighted accordingly. Weighted data were adjusted to be representative of the U.S. population on the basis of age, gender, race, ethnicity, and region of the country. To ensure adequate inclusion of underrepresented groups, the NESARC oversampled Black and Hispanic individuals, as well as young adults aged 18–24.

Data were collected by 1800 trained interviewers using laptop interview software (see Grant, Kaplan, et al., 2003). The first wave of NESARC was conducted in 2001–2002. Among the 43,093 respondents who participated in the Wave 1 interviews, 39,959 persons were eligible for a NESARC Wave 2 interview, and among these, 34,653 Wave 2 interviews were completed in 2004–2005 (Grant & Kaplan, 2005). Data from participants interviewed both at Waves 1 and 2 were analyzed in the present study. Of these, 20,089 (58%) were female.

Personality Disorder Diagnoses

Lifetime personality disorder (PD) symptoms and diagnoses were determined using the National Institute on Alcohol Abuse and Alcoholism *Alcohol Use Disorder and Associated Disabilities Interview Schedule—DSM–IV Version* (AUDADIS-IV). Interview questions were keyed to *DSM–IV* PD criteria and asked respondents about long-term patterns of cognition, emotional experience, and behavior that were context-free and not limited to periods of depression, mania, anxiety, heavy drinking, medication or drug influence, or withdrawal (Grant et al., 2004). Wave 1 of the NESARC included lifetime measurement of Antisocial, Avoidant, Dependent, Histrionic, Obsessive–Compulsive, Paranoid, and Schizoid PDs. Borderline, Narcissistic, and Schizotypal PDs were assessed at Wave 2, and Antisocial PD was assessed a second time (incorporating Wave 1 diagnostic information; note, however, that we used the Wave 1 antisocial diagnostic information in our analyses). Diagnostic criteria for each PD were measured by asking participants whether each *DSM–IV* PD criterion, as assessed by at least one interview question, was (a) descriptive of the participant (0 = *no*, 1 = *yes*), and (b) a cause of problems at work/school or in personal relationships (0 = *no*, 1 = *yes*). We scored each PD criterion as present only if it was judged descriptive of the participant and it caused problems or impairment. Note that the follow-up interview question about problems was not asked for antisocial criteria, presumably because impairment is implied (see Trull, Jahng, Tomko, & Sher, 2010, for more details about the prevalence rates of PDs in this sample using this scoring approach).

Previous reports indicate that 10-week test–retest reliability estimates for the seven Wave 1 PD diagnoses were fair to good (Grant, Dawson, et al., 2003). Kappa coefficients for diagnoses ranged from .40 to .67, and intraclass correlations for PD symptom counts ranged

from .55 to .79. Concerning the three Wave 2 PDs (Borderline, Narcissistic, Schizotypal), 6-week test–retest reliabilities for diagnoses ranged from .67 to .71 (kappas) and for symptom counts ranged from .71 to .75 (intraclass correlations; Ruan et al., 2008).

External Validators

Several variables were selected to serve as external validators of the final set of PD factors based on the factor analyses of all NESARC PD symptoms. Specifically, we included the following four sets of variables in the external validity analyses: (1) lifetime Axis I diagnoses, assessed at Wave 2 (any mood disorder, any anxiety disorder, any substance use disorder, any Axis I disorder; coded *present* vs. *absent*); (2) Lifetime treatment variables, composites across Waves 1 and 2 (See a doctor or therapist for mental health problems? Prescribed medication for mental health problems? Went to an emergency room for a mental health problem? Received inpatient treatment for a mental health problem?; coded *present* vs. *absent*); (3) interpersonal problems in the past year, assessed at Wave 2 (divorce, family problems, problems with boss, any interpersonal problem; coded *present* vs. *absent*); (4) suicidal thoughts and behaviors since the Wave 1 interview, assessed at Wave 2 (Any suicide attempts? Any suicidal thoughts? Wanting to die? Thinking about own death? Presence of any suicidal indicator?; coded *present* vs. *absent*), as well as (5) the physical disability score and mental disability score from *Version 2* of the *Short Form 12 Health Survey* (SF-12v2; Ware, Kosinkski, Turner-Bowker, & Gandek, 2002), a 12-item measure that taps life satisfaction and current functioning (over the last 4 weeks). Higher scores signify better functioning. Studies support the reliability and convergent validity of the SF-12v2 scale scores in both community and clinical samples (e.g., Ware et al., 2002).

Factor Analytic Approach

Because the NESARC study design called for the collection of PD data in two separate waves, a modified factor extraction technique was necessary for the factor analyses. This extraction technique adjusted correlations between criteria for Wave of assessment (Wave 1 vs. Wave 2) to estimate the relations among all PD criteria. Given that some PDs were assessed at Wave 1 and others at Wave 2, it is possible that occasion of measurement (i.e., common method variance) could constitute a third variable explanation for observed patterns of covariation between PD symptoms. Specifically, PD criteria might be correlated not for any conceptually relevant reasons, but instead because they were assessed at the same measurement occasion.[1]

Given the categorical (binary) nature of the PD criteria (present vs. absent), it was also necessary to use a latent response variable modeling approach in which observed categories of response are assumed to result from the categorization of an unmeasured latent continuum. Factor analysis of the data (which is described in more technical detail in the following paragraph) proceeded in two steps. In the first step, we extracted two mathematically identified orthogonal, unrotated factor patterns corresponding to method factors associated with wave of assessment. Additional factor solutions were generated by extracting orthogonal factors in addition to these two method factors. These additional substantive factors were specified as orthogonal factors, and in the second step, these substantive factors were rotated to a more conceptually interpretable oblique solution. These two steps were repeated for each factor dimension under consideration because initial extraction of two method factors required use of a confirmatory factor analysis model for the data. As a result, estimated factor loadings for the remaining, substantive factors could

[1]Indeed, the median intercorrelations among Wave 1 diagnoses with each other were much higher than those with the Wave 2 personality disorder diagnoses; the reverse was true for the Wave 2 personality disorder diagnoses. This matrix is available from Timothy J. Trull.

change slightly as a function of the dimensionality of successive solutions. We therefore calculated orthogonal factor solutions separately for each dimensionality considered (i.e., for the 3-, 4-, 5-, etc.-factor solution). Each submatrix of factor loadings other than those associated with the method factors was rotated to a more conceptually meaningful oblique factor solution.

Factor extraction was conducted using confirmatory factor modeling in Mplus (Muthén & Muthén, 2007), specifying that the indicators constituted binary categorical variables and using the weighted least squares means and variance loss function. As before, data were weighted in order to be representative of the U.S. population on the basis of age, gender, race, ethnicity, and region of the country. Two method factors were specified with factor variances set to unity to secure a mathematically identified solution. The first method factor (i.e., Wave 1 assessment) contained freely estimated factor loadings on the Paranoid, Schizoid, Histrionic, Avoidant, Dependent, Obsessive–Compulsive, and Antisocial criteria, whereas the second method factor (i.e., Wave 2 assessment) was specified by freely estimated loadings on the symptoms assessing Schizotypal, Borderline, and Narcissistic PDs. The next factor (i.e., the first substantive orthogonal factor) had freely estimated loadings across all criteria and unit variance. The second substantive factor was extracted with loadings across all criteria, but with the first criterion of Paranoid PD fixed to zero to secure a mathematically identified solution. Five additional factors were extracted in similar fashion, with additional loadings set to zero for the first criterion associated with Borderline, Avoidant, Antisocial, Dependent, and Schizoid PDs, respectively.

An oblique rotation was then applied to each submatrix, and the rotation of these solutions was examined for interpretability and consistency across rotational technique. Given the sample size involved, statistical fit indices for these data consistently favored the extraction of more factors. Ultimately, the seven-factor solution was retained not solely on the basis of statistical tests alone, but also because of the interpretability of the resulting solution. Specifically, when additional factors beyond seven were extracted and rotated, some factors did not appear to have practically significant loadings on many of the PD criteria. Conversely, when solutions with fewer factors than seven were considered, some of the PDs were not represented in the rotated solution. Although a number of oblique rotation techniques were considered across all dimensionalities (geomin, Promax, biquartimin, covarimin, equamax, oblimax, parsimax, infomax), the geomin-rotated solution is reported here as representing the most typical factor pattern solution across the techniques.

Results

For ease of presentation and interpretation, Table 2 shows median factor loadings across symptoms comprising each PD for the seven-factor, geomin-rotated solution, and beneath each entry, the minimum and maximum factor loadings within each PD diagnosis.[2] From this, it can be seen, for example, that the first factor in this solution appears to load only on criteria corresponding to the Paranoid PD diagnosis (Factor 1), but that loadings are not consistent across all symptoms, with one criterion loading as low as .21 and another criterion loading as high as .61. In similar fashion, the remaining six factors appear to load on Schizotypal and Borderline disorders (with a secondary pattern of loadings on Narcissistic personality disorder; Factor 2), on Avoidant and Dependent personality disorders (Factor 3), on Antisocial Personality disorder (Factor 4), Schizoid (Factor 5), Obsessive/Compulsive (Factor 6), and Narcissistic (Factor 7) personality disorders. It is worth noting that symptoms for Histrionic personality disorder did not load predominantly on any particular factor, although one criterion did load .45 on Factor 4, which was

[2]The entire list of loadings is available from Timothy J. Trull.

otherwise marked by Antisocial Personality disorder symptoms. Factor correlations shown in Table 3 indicate moderate correlations between the first three factors, as well as some correlation between the Antisocial PD factor and Factor 3 (Schizotypal/Borderline/Narcissistic). The remaining factor correlations were relatively small.

In order to provide further validation for the exploratory factor analysis solution, a series of regression analyses (and logistic regression analyses for categorical outcomes) were conducted to examine the association between the PD factors and a number of outcomes. For the regression analyses, sampling weights were applied to adjust the data to be representative of the U.S. population and provide appropriate standard errors. A composite score was created for each of the seven PD factors and for the Wave 1 method factor.[3] The composite measures represent the mean PD symptom score for the PDs in Table 2 that targeted each respective factor and wave (boldface in Table 2). These composite variables were included as simultaneous predictors in regression analyses with Axis I disorder, treatment utilization, general functioning, and suicidal behavior variables as outcomes. Gender, age, and ethnicity were used as covariates in the regression analyses because they were significantly correlated with the outcome criteria in almost every case. All analyses were conducted using Mplus 6.1 (Muthén & Muthén, 1998–2008).

Table 4 shows the bivariate, zero-order correlations among the composite measures of the factors, the outcome variables, and the covariates. As can be seen, all composite measures are positively correlated with each other and with the Wave 1 method factor. Moreover, all composite measures were positively correlated with all the outcome variables and were negatively correlated with SF-12v2 Physical Disability and Mental Disability scores, respectively.

Table 5 presents the results of regression analyses involving continuous (e.g., physical disability score; mental disability score) and categorical (e.g., Any Axis I disorder) outcomes, controlling for gender, age, and ethnicity. All composite measures were entered simultaneously as predictors in order to determine the unique relations among factor composites and outcomes. Factor 2 composite (comprised of symptoms from schizotypal, borderline, and narcissistic PDs) was significantly associated with all the outcomes, and Factor 7 composite (a residualized narcissism factor) was significantly associated with almost all outcomes with the exception of any interpersonal problem and neighbors/friends/relatives problems. The Factor 7 composite's negative relations with most outcome scores indicates a suppressor effect given that this factor's bivariate relations with these outcomes were positive (see Table 4).

The remaining factor composites had more specific associations. Factor 1 composite (composed of symptoms from paranoid PD) was related to interpersonal problems with the exception of recent divorce. Factor 3 composite (composed of symptoms from avoidant and dependent PD) was related to any anxiety disorder, treatment with prescribed medications, and mental disability scale scores. Factor 4 composite (composed of criteria from antisocial and histrionic PDs) was associated with any Axis I disorder, any substance abuse disorder (SUD), emergency room and inpatient care, and all interpersonal problem variables. Factor 5 composite (composed of symptoms from schizoid and avoidant PDs) was positively associated with physical disability scale scores, any interpersonal problem, and recent divorce. Factor 6 composite (composed of criteria from obsessive–compulsive PD) was related to lower rates of inpatient treatment, higher physical disability scale scores, any interpersonal problem, and problems with boss. Finally, the Wave 1 method factor

[3]A Wave 2 method factor was not included in regression analyses because its composite measure was identical to Factor 2.

composite was associated with doctor or therapist treatment, lower physical disability scale scores, and lower rates of interpersonal problems.

Regression analyses including interactions between each of the seven-factor composites, and the three covariates were also conducted. However, the number of significant interactions was higher than chance expectations (as determined by probabilities under the binomial distribution with $p = .05$) for only four of the 19 outcomes, and examination of the plots did not reveal any consistent or interpretable interaction pattern.

Discussion

We found that a seven-factor model best characterized dimensions underlying the *DSM–IV* PD criteria in a large, representative community sample of U.S. residents. Each identified factor was primarily characterized by the criteria set from one, or at most, two individual PDs. Compared to many of the previous studies that conducted factor analyses of individual PD criteria (see Table 1), we found support for relatively fewer factors. However, several factors we identified were similar to those previously identified in these earlier studies. A paranoid PD factor (Factor 1) was identified in five of the six previous studies, an avoidant/dependent factor (Factor 3) in three studies, an antisocial factor (Factor 4) in five studies, a schizoid factor (Factor 5) in three studies, and an obsessive–compulsive factor (Factor 6) in six studies. In contrast, our factors of emotional/cognitive dysregulation (Factor 2) and narcissism (Factor 7) were not well-represented in previous factor analytic studies.

Recall, however, that our factor extraction method differed from previous studies in two important ways. First, because of the methodological design of the NESARC (assessing different PDs in the two waves), we modeled and controlled for method factors before "substantive" factor extraction and rotation. This was relatively successful, although this does somewhat cloud the interpretation of Factor 2 (emotional/cognitive dysregulation). On the one hand, Factor 2 does seem to be well-defined by symptoms tapping a variety of forms of dysregulation that characterize PDs (the five highest loading criteria were odd thinking/speech, odd behavior, affective instability, chronic emptiness, and unusual perceptions). On the other hand, this factor is best represented by symptoms from the schizotypal, borderline, and narcissistic PDs, all of which were assessed at Wave 2. Therefore, although this could represent an important substantive factor that overlaps with major dimensions of personality pathology (e.g., negative affectivity, emotional dysregulation, cognitive/perceptual dysfunction, and psychoticism; Widiger & Simonsen, 2005), further replication is needed to rule out that this factor exists independent of possible method artifact. These findings highlight this serious design limitation of the NESARC (i.e., confounding construct assessment with time of assessment) and raises serious questions of interpretability of both measurement models and structural models of NESARC PD symptomatology that fail to address this knotty problem.

A second important difference in our study is the sequential method of factor extraction that we used. As described above, in order to extract orthogonal factors in the presence of the two method factors corresponding to wave of assessment, a confirmatory factor model was initially fit. As a result, the entire variance/covariance matrix was factored rather than a matrix of estimated or assumed communalities on the diagonal. Although this approach resulted in minor changes to estimated loadings as a function of the number of extracted factors, these differences did not appear to be substantively appreciable. To the extent, however, that partial confounding overlap exists between "true" covariation and wave of assessment, the present study may obscure additional patterns of covariation. This limitation, however, is an inherent limitation of the design of the NESARC. Future research could address this possibility either by assessing all psychopathology in one assessment or

by administering subsets of criteria across all forms of psychopathology at each wave of assessment.

Additionally, some substantive concerns may be raised regarding the appropriateness of any factor model for the assessment of comorbidity of psychopathology. To the extent that confirmatory factor models (or exploratory factor models, for that matter) assume that all relationships between disorders (or criteria) are due to the presence of latent variables, structural relationships between disorders/symptoms may be misrepresented. It may be, for example, that some disorders/symptoms directly cause others. Yet others may serve as indicators of a latent variable construct but also exert additional causal effects (as occurs, by analogy, in the case of some types of drug use leading to use of other types of drugs). Exploration of such alternative models of causality could be done using exploratory heuristics such as the TETRAD approach (Glymour, Scheines, & Spirtes, 1988). Additionally, more robust estimation of exploratory factor models is also possible (e.g., Hartmann, 2011), but the two-wave design limitation of the NESARC study prevented their implementation in this case.

A more substantial limitation of the study is inherent in the binary measurements used in assessment of psychopathology. Disorder or symptom assessments are not well modeled by binary measurement, and the latent response variable model used here is not ideal and certainly limiting in the form and possible relationships that can be explored. As Millsap and Yun-Tein (2004) note, binary ordered categorical variables require the researcher to assume a latent response variable with fixed mean and variance (e.g., normally distributed variables may require means of zero and unit variances). If it is the case that differential variability exists, the present approach would yield biased estimates of the patterns of association between symptoms.

Finally, it must be noted that the factor analytic approach (or any factor model, for that matter) is a variable-centered, as opposed to person-centered approach to the assessment of comorbidity. As such, it is possible that patterns of covariation may be due to the presence of different clusters or subsets of individuals. Alternatively, it is also premature to conclude that patterns of covariation found in the present study necessarily generalize to co-occurring functional relationships at the individual level. In order to determine whether this is the case, it would be necessary to evaluate the psychometric properties of the diagnostic measurements and to gather longitudinal individual-level data (see Molenaar & Campbell, 2009, for a description of individual-level analyses and theory construction.).

Our findings do provide some empirical support for the NESARC personality disorder symptom interview as well, considering that the NESARC investigators included interview items to specifically tap the criteria from the 10 individual PD diagnoses. Although it is true that our best factor solution did not include the 10 specific PDs outlined in *DSM–IV–TR* (APA, 2000), given our findings and those of previous investigators, it appears that some PDs are comprised of more homogeneous criteria than are others. Specifically, the symptoms for paranoid, antisocial, schizoid, obsessive–compulsive, and narcissistic PDs, as currently defined, seem relatively internally consistent. Further, it is worth noting that most models of personality pathology, whether *DSM–IV* based or not, include factors characterized by antisocial behavior, introversion/inhibition, and compulsivity (Widiger & Simonsen, 2005).

One important feature of our study was our series of external validity analyses aimed at providing support for the factors we extracted. In general, these results appeared to support the substantive interpretation of these factors. Our regression analyses revealed many unique relations between the factor composite scores and external criteria, and these were largely

consistent with our substantive interpretation of each factor. For example, Factor 1 scores (Paranoid) were associated primarily with a range of interpersonal problems. Factor 2 scores (Emotional/Cognitive Dysregulation) appear to index severe personality pathology as evidenced by the significant associations with Axis I pathology, treatment for mental health problems, mental health problem scores, and the presence of suicidal thoughts, gestures, and behaviors. In contrast, Factor 3 scores (Avoidant/Dependent) were significantly associated with anxiety disorders and taking prescription medications for mental health problems. Factor 4 scores (Antisocial) were significantly associated with substance use disorder diagnoses, interpersonal problems, and both emergency room visits and inpatient hospitalizations. Factor 5 scores (Schizoid, Introversion) were significantly associated with self-reported physical disability and interpersonal problems (particularly divorce). Finally, Factor 6 scores (Obsessive–Compulsive) were correlated with self-reported physical problems and with interpersonal problems (especially with a boss).

Our findings also have several implications for the DSM-5 PDs that are currently being proposed. Currently, the PD Workgroup is proposing to retain six specific personality disorders: schizotypal, borderline, antisocial, narcissistic, avoidant, and obsessive–compulsive PDs (Skodol, in press). Using the NESARC data, we did uncover factors characterized by the criteria from all these PDs. However, among the six DSM-5 PDs, the strongest evidence for factors for specific PDs was obtained for antisocial, obsessive–compulsive, and narcissistic PDs. From the perspective of factorial validity, our findings also suggest that both paranoid and schizoid PD might be considered for inclusion. It is clear, however, that the Workgroup is weighing many variables when making its decisions, including the amount of published research on each PD, frequency that the condition is encountered in clinical practice, and the like.

It is also worth noting that DSM-5 will likely require a separate determination of personality impairment from the assessment of features of individual PD types. According to the latest version of the proposal (Skodol, in press), the diagnostician is asked to first determine whether impairment in personality functioning (i.e., identity, self-direction, empathy, intimacy) is present and, if so, to what degree. If significant personality dysfunction is present, the clinician considers whether one (or more?) of the six proposed personality disorder types are present: borderline, obsessive–compulsive, avoidant, schizotypal, antisocial, or narcissistic. For each of these proposed PD types, a listing of characteristic trait elevations is provided. The current proposal lists 25 maladaptive personality traits, organized within five broad domains, which can be rated for each individual. Our findings indicate that the factors underlying *DSM–IV–TR* PD criteria were consistently and significantly associated with personality impairment, typically in the form of interpersonal problems. Thus, our findings support the assumption that PD pathology is associated with personality functioning even when measured independently from the PD criteria themselves.

Although the present study has a number of strengths (i.e., large sample size, interview-based assessment of PDs), there are a few important limitations. First, not all of the *DSM–IV* personality disorders were included in the first wave of NESARC. As noted above, this necessitated modeling common method variance to account for the variation in assessment of these PDs. Although we partitioned this source of variance as much as the data would allow, residual method variance may still have contaminated at least one of the substantive factors (our Factor 2). Second, the NESARC study assessed lifetime diagnoses of personality disorder diagnoses, compared to some of the other studies listed in Table 2. Given that lifetime diagnoses can be notoriously unreliable, especially in non-clinical samples (e.g., Vandiver & Sher, 1991) and that there is substantial change in basic personality traits over the life course (Roberts, Walton, & Viechtbauer, 2006), it is possible

that a more temporally bounded PD assessment could have yielded a somewhat different pattern of findings.

Despite these and other limitations (e.g., lay interviewers and a highly structured interviewed that may have lacked the ability to resolve subtle aspects of personality pathology), we feel that the present study makes important contributions by demonstrating the use of a statistical method for accounting for PD comorbidity and identifying important specific PD factor-outcome associations.

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Table 1

Studies Examining the Latent Factor Structure Underlying DSM-III-R or DSM-IV Personality Disorder Criteria

Study	Instrument	Factors identified	
Blackburn et al. (2005)[a]	IPDE	**1**	Narcissitic-histrionic
		2	Paranoid
		3	Delinquent
		4	Dependent-avoidant
		5	Obsessive-compulsive
		6	Schizoid
		7	Borderline
		8	Antisocial
		9	Aggressive
Durrett & Westen (2005)[b]	DSM-IV item checklist	**1**	Avoidant
		2	Antisocial
		3	Histrionic
		4	Narcissistic
		5	Schizoid
		6	Paranoid
		7	Obsessive-compulsive
		8	Schizotypal
		9	Dependent
		10	Borderline
Howard et al. (2008)[c]	IPDE	**1**	Histrionic-narcissistic
		2	Conduct disorder
		3	Antisocial
		4	Avoidant
		5	borderline
		6	Dependent-practical
		7	Paranoid
		8	Obsessive-compulsive
		9	Attachment sensitivity
		10	Schizotypal
Huprich et al. (2010)[d]	SIDP-IV	**1**	Social avoidance and neediness
		2	Antisocial/psychopathic
		3	Paranoid
		4	Schizoid/schizotypal
		5	Histrionic relationship seeking
		6	Borderline/emotional dysregulation
		7	Grandiose narcissism
		8	Dependent

Study	Instrument	Factors identified	
		9	Obsessive-compulsive
		10	Agreeableness
Thomas et al. (2003)[e,f]	Peer report of DSM-IV items	**1**	Histrionic/narcissistic
		2	Dependent/avoidant[e]
		3	Detachment; schizoid[f]
		4	Aggression/mistrust; paranoid
		5	Antisocial
		6	Obsessive-compulsive
		7	Schizotypal
Nestadt et al. (2006)[g]	IPDE	**1**	Compulsive; obsessive compulsive
		2	Aloof; SZD/SZT/AVD/PAR
		3	Neurotic avoidant; AVD/DEP
		4	Impulsive callous; ATS/HIS/BPD/NAR
		5	Egocentric; HIS/NAR

Note. ATS = Antisocial; AVD = Avoidant; BPD = Borderline; DEP = Dependent; DSM-III-R *Diagnostic and statistical manual of mental disorders* (3rd ed., revised); DSM-IV *Diagnostic and statistical manual of mental disorders* (4th ed.); HIS = Histrionic; IPDE = International Personality Disorder Examination; NAR = Narcissistic; PAR = Paranoid; SIDP-IV = Structured Interview for DSM-IV Personality; SZD = Schizoid; SZT = Schizotypal.

[a] n = 168 male forensic patients.

[b] n = 294 adolescent patients.

[c] n = 224 community residents.

[d] n = 1,200 psychiatric outpatients.

[e] n = 1,440 college students.

[f] n = 2,075 Air Force recruits.

[g] n = 742 community residents.

Table 2

Median, Maximum, and Minimum Factor Loadings Across Personality Disorder Criteria

	Factor						
Personality disorder	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Paranoid	**0.43** (0.21, 0.61)	0.04 (0.00, 0.09)	0.13 (0.03, 0.24)	0.17 (0.11, 0.24)	0.07 (−0.02, 0.20)	0.07 (−0.07, 0.14)	0.01 (−0.10, 0.06)
Schizoid	0.09 (−0.06, 0.17)	0.06 (0.01, 0.13)	0.04 (−0.18, 0.18)	0.07 (−0.07, 0.24)	**0.40** (0.18, 0.51)	−0.08 (−0.27, 0.15)	−0.01 (−0.17, 0.07)
Schizotypal	0.06 (−0.15, 0.23)	**0.63** (0.36, 0.83)	−0.01 (−0.09, 0.06)	−0.03 (−0.13, 0.11)	0.10 (−0.11, 0.37)	0.02 (−0.10, 0.09)	0.02 (−0.05, 0.09)
Borderline	0.05 (−0.06, 0.16)	**0.61** (0.52, 0.70)	0.09 (−0.01, 0.18)	0.13 (0.03, 0.30)	−0.02 (−0.06, 0.02)	0.00 (−0.04, 0.07)	−0.08 (−0.29, 0.07)
Histrionic	0.11 (−0.07, 0.35)	0.04 (−0.04, 0.17)	0.15 (0.02, 0.27)	0.26 (0.08, 0.45)	−0.14 (−0.37, 0.24)	0.03 (−0.12, 0.15)	0.14 (−0.05, 0.38)
Narcotics	0.06 (−0.15, 0.23)	**0.36** (0.25, 0.46)	0.00 (−0.10, 0.17)	−0.01 (−0.10, 0.07)	0.03 (−0.13, 0.17)	0.00 (−0.11, 0.08)	**0.39** (0.17, 0.51)
Avoidant	0.07 (0.00, 0.14)	−0.02 (−0.05, 0.05)	**0.59** (0.44, 0.69)	0.02 (−0.09, 0.18)	0.26 (0.13, 0.42)	0.10 (0.02, 0.22)	−0.02 (−0.11, 0.09)
Dependent	−0.02 (−0.14, 0.07)	0.07 (−0.04, 0.20)	**0.65** (0.58, 0.75)	0.02 (−0.08, 0.20)	−0.01 (−0.10, 0.10)	−0.03 (−0.19, 0.17)	0.02 (−0.05, 0.14)
Obsessive–compulsive	0.04 (−0.07, 0.17)	0.08 (−0.01, 0.12)	0.10 (−0.07, 0.35)	0.06 (−0.02, 0.29)	0.02 (−0.08, 0.15)	**0.37** (0.19, 0.47)	0.01 (−0.08, 0.09)
Antisocial	0.02 (−0.13, 0.15)	0.01 (−0.06, 0.08)	−0.02 (−0.26, 0.16)	**0.72** (0.60, 0.85)	0.04 (0.00, 0.06)	0.02 (−0.06, 0.12)	−0.01 (−0.08,0.03)

Note. Values in parentheses are the minimum and maximum factor loadings within each PD diagnosis. Boldface values indicate the mean PD symptom score for the PDs that targeted each respective factor and wave.

Table 3

Factor Intercorrelations

	Factor						
Factor	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	1.00						
2	**0.41**	1.00					
3	**0.47**	**0.36**	1.00				
4	0.29	**0.37**	**0.32**	1.00			
5	0.27	0.18	0.19	0.23	1.00		
6	0.18	0.11	0.21	0.25	0.24	1.00	
7	0.14	0.30	−0.06	0.18	0.01	0.10	1.00

Note. Boldface values indicate significant moderate correlations.

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Table 4

Factor Composite and Outcome Score Bivariate Correlations

	F1	F2	F3	F4	F5	F6	F7	w1	Any Axis I	Any mood	Any anx.	Any SUD	Doc./ther.	Pres. med.
F1														
F2	0.32*													
F3	0.54*	0.27*												
F4	0.44*	0.32*	0.33*											
F5	0.58*	0.30*	0.86*	0.37*										
F6	0.53*	0.27*	0.43*	0.39*	0.48*									
F7	0.22*	0.81*	0.15*	0.23*	0.17*	0.22*								
w1	0.77*	0.39*	0.70*	0.81*	0.75*	0.71*	0.27*							
Any Axis I	0.38*	0.49*	0.40*	0.61*	0.42*	0.33*	0.28*	0.69*						
Any mood	0.34*	0.39*	0.35*	0.36*	0.36*	0.29*	0.23*	0.46*	0.96*					
Any Anx.	0.32*	0.38*	0.33*	0.29*	0.34*	0.28*	0.24*	0.40*	0.99*	0.60*				
Any SUD	0.16*	0.22*	0.11*	0.55*	0.13*	0.15*	0.15*	0.41*	1.00*	0.26*	0.21*			
Doc./ther.	0.26*	0.33*	0.28*	0.32*	0.28*	0.24*	0.20*	0.38*	0.71*	0.75*	0.65*	0.29*		
Pres. med.	0.24*	0.29*	0.25*	0.25*	0.25*	0.21*	0.17*	0.31*	0.66*	0.74*	0.65*	0.20*	0.92*	
ER	0.22*	0.25*	0.20*	0.30*	0.21*	0.18*	0.16*	0.30*	0.58*	0.52*	0.54*	0.29*	0.75*	0.73*
Inp.	0.21*	0.27*	0.20*	0.34*	0.21*	0.17*	0.17*	0.31*	0.60*	0.51*	0.42*	0.41*	0.74*	0.65*
PCS	−0.05*	−0.06*	−0.05*	−0.02*	−0.05*	−0.03*	−0.03*	−0.04*	−0.03*	−0.09*	−0.11*	0.07*	−0.14*	−0.20*
PCSM	−0.18*	−0.30*	−0.18*	−0.15*	−0.19*	−0.14*	−0.18*	−0.21*	−0.28*	−0.37*	−0.33*	−0.09*	−0.35*	−0.37*
Any int. pr.	0.17*	0.29*	0.11*	0.24*	0.13*	0.15*	0.23*	0.23*	0.38*	0.40*	0.31*	0.27*	0.34*	0.30*
Divor.	0.12*	0.18*	0.07*	0.19*	0.09*	0.08*	0.13*	0.16*	0.30*	0.31*	0.20*	0.25*	0.24*	0.19*
Family	0.16*	0.25*	0.10*	0.20*	0.12*	0.14*	0.20*	0.19*	0.34*	0.37*	0.34*	0.18*	0.36*	0.34*
Boss	0.14*	0.22*	0.09*	0.21*	0.10*	0.13*	0.20*	0.19*	0.33*	0.33*	0.24*	0.24*	0.27*	0.23*
Any suic.	0.20*	0.33*	0.19*	0.21*	0.20*	0.16*	0.21*	0.25*	0.58*	0.72*	0.53*	0.17*	0.60*	0.61*
Attem.	0.18*	0.24*	0.15*	0.20*	0.16*	0.13*	0.15*	0.20*	0.55*	0.60*	0.44*	0.24*	0.58*	0.62*

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	F1	F2	F3	F4	F5	F6	F7	w1	Any Axis I	Any mood	Any anx.	Any SUD	Doc./ther.	Pres. med.
Thought	0.20*	0.31*	0.18*	0.25*	0.20*	0.17*	0.20*	0.25*	0.66*	0.72*	0.52*	0.24*	0.64*	0.61*
Want	0.20*	0.32*	0.18*	0.22*	0.19*	0.15*	0.20*	0.24*	0.59*	0.74*	0.53*	0.18*	0.62*	0.62*
Death	0.19*	0.28*	0.17*	0.20*	0.18*	0.14*	0.19*	0.22*	0.52*	0.65*	0.49*	0.14*	0.52*	0.54*
Sex	0.06*	−0.02*	0.05*	−0.20*	0.03*	0.00	−0.06*	−0.07*	−0.09*	0.20*	0.27*	−0.41*	0.21*	0.28*
Age	−0.10*	−0.12*	−0.08*	−0.21*	−0.08*	−0.05*	−0.08*	−0.17*	−0.20*	−0.16*	−0.08*	−0.22*	−0.08*	0.01
Ethnicity	0.01	0.01	−0.02*	−0.07*	−0.01*	−0.04*	0.04*	−0.04*	−0.15*	−0.05*	−0.07*	−0.18*	−0.16*	−0.17*

	ER	Inp.	PCS	PCSM	Any int. pr.	Divor.	Family	Boss	Any suic.	Attem.	Thought	Want	Death	Sex	Age
Inp.	0.83*														
PCS	−0.18*	−0.21*													
PCSM	−0.29*	−0.27*	0.12*												
Any int. pr.	0.28*	0.25*	0.06*	−0.28*											
Divor	0.20*	0.19*	0.09*	−0.21*	0.98*										
Family	0.31*	0.26*	−0.07*	−0.29*	1.00*	0.33*									
Boss	0.20*	0.19*	0.11*	−0.20*	0.99*	0.24*	0.37*								
Any suic.	0.50*	0.47*	−0.17*	−0.45*	0.37*	0.30*	0.39*	0.25*							
Attem	0.61*	0.61*	−0.16*	−0.38*	0.35*	0.31*	0.32*	0.28*	0.91*						
Thought	0.53*	0.54*	−0.15*	−0.45*	0.40*	0.35*	0.40*	0.26*	0.98*	0.90*					
Want	0.51*	0.49*	−0.17*	−0.46*	0.38*	0.32*	0.39*	0.25*	0.99*	0.84*	0.96*				
Death	0.46*	0.42*	−0.17*	−0.39*	0.29*	0.23*	0.32*	0.19*	0.99*	0.74*	0.82*	0.84*			
Sex	0.09*	−0.04*	−0.08*	−0.14*	0.04*	0.01	0.13*	−0.01	0.15*	0.13*	0.11*	0.17*	0.10*		
Age	−0.05*	−0.03*	−0.38*	0.04*	−0.31*	−0.35*	−0.12*	−0.30*	−0.08*	−0.22*	−0.15*	−0.11*	−0.06*	0.05*	
Ethnicity	−0.03*	−0.05*	0.02*	−0.01	0.01	0.08*	−0.04*	0.01	−0.01	0.08*	−0.03	−0.01	0.02	−0.01	−0.22*

Note. F1–F7 = PD factors found in EFA analysis; w1 = method factor related to Wave 1 measurement; Any Axis I = any Axis I disorder; Any mood = any mood disorder; Any anx. = any anxiety disorder; Any SUD = any substance use disorder; Doc./ther. = ever seen a doctor or therapist for mental health; Pres. med. = prescribed medication for mental health; ER = went to emergency room for mental health problem; Inp. = inpatient treatment for mental health problem; PCS = physical disability score; PCSM = mental disability score; Any int. pr. = any interpersonal problem; Divor. = divorce; Family = family problems; Boss = problems with boss; Any suic. = any suicidal indicator; Attem. = suicidal attempt; Thought = suicidal thought; Want = wanting to die; Death = thinking about own death.

*$p < .05$.

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Table 5

Factor Composite Score Standardized Regression Weights and Standard Errors Associated With Outcome Scores

	F1	F2	F3	F4	F5	F6	F7	w1
Any Axis I	0.01 (0.06)	0.37 (0.02)***	0.04 (0.04)	0.32 (0.13)*	−0.01 (0.06)	−0.01 (0.06)	−0.10 (0.01)***	0.23 (0.26)
Any mood	0.07 (0.05)	0.36 (0.01)***	0.05 (0.03)	0.19 (0.11)	0.08 (0.05)	0.06 (0.05)	−0.13 (0.01)***	0.01 (0.21)
Any anxiety	0.08 (0.05)	0.34 (0.02)***	0.06 (0.03)*	0.14 (0.10)	0.06 (0.05)	0.07 (0.05)	−0.10 (0.01)***	0.01 (0.20)
Any SUD	0.03 (0.04)	0.11 (0.01)***	0.03 (0.03)	0.62 (0.08)***	0.01 (0.04)	0.04 (0.04)	−0.04 (0.01)**	−0.28 (0.16)
Doctor/therapist	−0.07 (0.04)	0.33 (0.02)***	0.05 (0.03)	0.03 (0.08)	−0.07 (0.04)	−0.05 (0.04)	−0.13 (0.02)***	0.36 (0.16)*
Prescribed med.	0.05 (0.04)	0.32 (0.02)***	0.09 (0.03)**	0.17 (0.09)	0.01 (0.04)	0.04 (0.04)	−0.14 (0.02)***	−0.04 (0.17)
ER	0.01 (0.04)	0.27 (0.02)***	0.03 (0.03)	0.18 (0.09)*	−0.01 (0.04)	−0.04 (0.04)	−0.15 (0.02)***	0.11 (0.17)
Inpatient	−0.05 (0.04)	0.30 (0.02)***	0.03 (0.03)	0.18 (0.09)*	−0.04 (0.04)	−0.09 (0.04)*	−0.17 (0.02)***	0.22 (0.17)
PCS	0.06 (0.03)	−0.13 (0.01)***	0.02 (0.02)	0.11 (0.07)	0.07 (0.03)**	0.10 (0.03)**	0.06 (0.01)***	−0.36 (0.13)**
PCSM	−0.04 (0.04)	−0.37 (0.02)***	−0.06 (0.03)*	−0.06 (0.08)	−0.03 (0.03)	−0.02 (0.04)	0.14 (0.01)***	0.05 (0.16)
Any int. prob.	0.13 (0.04)**	0.19 (0.02)***	0.01 (0.03)	0.31 (0.08)***	0.09 (0.03)**	0.12 (0.04)**	0.02 (0.02)	−0.42 (0.15)**
Divorced	0.10 (0.05)	0.16 (0.02)***	−0.01 (0.03)	0.27 (0.11)*	0.10 (0.05)*	0.07 (0.05)	−0.06 (0.02)**	−0.35 (0.21)
Family	0.12 (0.05)*	0.23 (0.02)***	0.02 (0.04)	0.25 (0.11)*	0.03 (0.04)	0.10 (0.05)	−0.03 (0.02)	−0.30 (0.22)
Boss	0.09 (0.04)*	0.08 (0.02)***	0.02 (0.03)	0.26 (0.09)**	0.06 (0.04)	0.10 (0.04)*	0.06 (0.02)***	−0.33 (0.18)
Any suicidal	−0.03 (0.05)	0.42 (0.02)***	−0.00 (0.03)	−0.01 (0.11)	0.02 (0.05)	−0.05 (0.05)	−0.18 (0.02)***	0.18 (0.21)
Attempt	0.04 (0.09)	0.39 (0.03)***	0.04 (0.07)	0.01 (0.19)	0.00 (0.08)	−0.07 (0.09)	−0.25 (0.05)***	0.05 (0.36)
Thought	0.04 (0.05)	0.42 (0.02)***	0.05 (0.04)	0.18 (0.10)	0.06 (0.04)	0.03 (0.05)	−0.22 (0.03)***	−0.14 (0.19)
Want	0.04 (0.05)	0.42 (0.02)***	0.04 (0.03)	0.13 (0.10)	0.05 (0.04)	0.01 (0.05)	−0.19 (0.02)***	−0.10 (0.20)
Death	0.02 (0.06)	0.37 (0.02)***	0.02 (0.04)	0.03 (0.12)	0.04 (0.05)	−0.04 (0.06)	−0.16 (0.02)***	0.06 (0.23)

Note. F1–F7 = PD factors found in EFA analysis; w1 = method factor related to wave 1 measurement; Any Axis I = any axis I disorder; Any mood = any mood disorder; Any anx. = any anxiety disorder; Any SUD = any substance use disorder; Doc./ther. = ever seen a doctor or therapist for mental health; Pres. med. = prescribed medication for mental health; ER = went to emergency room for mental health problem; Inp. = inpatient treatment for mental health problem; PCS = physical disability score; PCSM = mental disability score; Any int. pr. = any interpersonal problem; Divor. = divorce; Family = family problems; Boss = problems with boss; Any suic. = any suicidal indicator; Attem. = suicidal attempt; Thought = suicidal thought; Want = wanting to die; Death = thinking about own death.

*$p < .05$.

**$p < .01$.

$^{***}p < .001$.